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TEXAS AGRICULTURAL EXPERIMENT STATION

AGRICULTURAL AND MECHANICAL COLLEGE OF TEXAS

W. B. BIZZELL, President

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- 3 NOV. 1921

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THIRTIETH ANNUAL REPORT

1917

THIRTY-FIRST ANNUAL REPORT

1918



B. YOUNGBLOOD, DIRECTOR

COLLEGE STATION, BRAZOS COUNTY, TEXAS

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B. YOUNGBLOOD, DIRECTOR,
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†As of December 1, 1918.

*In cooperation with the School of Veterinary Medicine, A. & M. College of Texas.

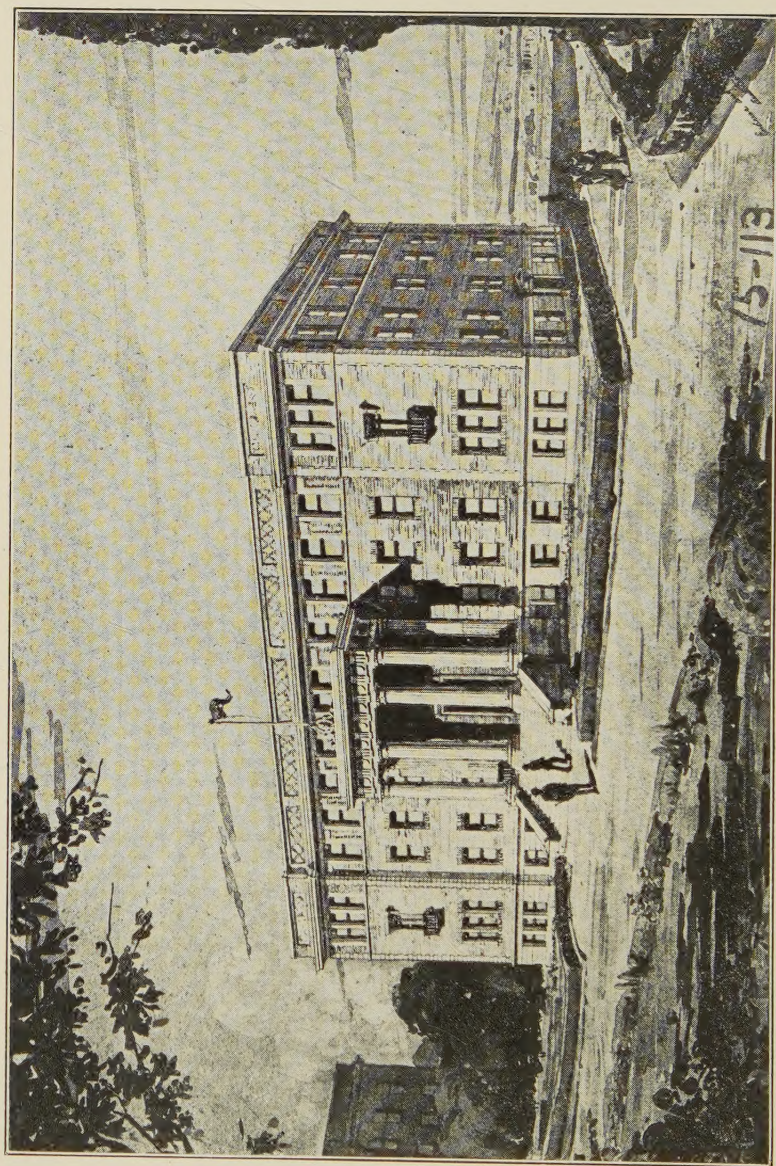
**In cooperation with the United States Department of Agriculture.

CONTENTS

	PAGE
Frontispiece	4
The Station's part in winning the war.....	5
Soil surveys	6
Animal Industry	7
New building	8
The work by divisions.....	9
Veterinary Science	9
Chemistry	9
Horticulture	10
Animal Industry	11
Feeding investigations	11
Sheep and goat breeding investigations.....	11
Swine investigations	12
Entomology	13
Agronomy	14
Plant Pathology and Physiology.....	16
Poultry Husbandry	17
Forestry	18
Dairying	18
Plant Breeding	19
Feed Control Service.....	19
Substations	20
Cooperation	21
Publications	22
Correspondence	26
Station lands	27
Distribution of Station properties.....	27
Financial statement	27
Acknowledgments	40



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THE NEW EXPERIMENT STATION BUILDING.

THIRTIETH AND THIRTY-FIRST ANNUAL REPORTS OF THE TEXAS AGRICULTURAL EXPERIMENT STATION

B. YOUNGBLOOD, DIRECTOR

THE STATION'S PART IN WINNING THE WAR

The two-year period covered by this report is practically the same period of time as this country's participation in the world war. The victory just won is the most unique in the annals of history, because of the fact that, in the beginning, agriculture played an unusually prominent part. When the country entered the war, the food stores of the Allies were so low that the responsibility of feeding and clothing the fighting men, and the civilians as well, fell to the hands of the American farmers and stockmen. An immediate demand was made upon the experiment stations of the country for the kinds of information which might at once be put quickly into action on the farms and ranches.

Nothing could have been more fortunate for the country than the fact that thirty years previously an experiment station system had been provided for each State and territory. During this time, the experiment stations, through their laboratories and experiment farms, had been turning out a type of information which could be put into immediate service when the war began. During the past two years, it has become axiomatic that the experiment stations and Federal research laboratories of the country constituted the only branch or branches of the public service which were at all prepared to begin the offensive the day that war was declared.

Now that the war is over, and research has proved its usefulness, the stations should no longer be neglected to the degree that they were in days gone by. They should be properly manned and equipped for not merely a few of the more important agricultural problems of the State, but for the investigation of all the problems of importance affecting Texas agriculture. The Experiment Station, like a great piece of machinery, can only be operated with the highest degree of efficiency when all the essential parts are present and kept in perfect condition. While recent legislatures have been increasingly liberal in their support of Experiment Station work in Texas, there have been times when it was difficult to convince them of the necessity of providing all the essentials to successful Station work. During the past two years, the funds provided for the Station would have been much more useful had the Appropriations Bill not been cut up into a vast number of separate appropriations. The inflexibility of the appropriations thus secured has made it impossible to handle all the affairs of the Station in the most thorough-going and business-like manner. Such a system works no more to the advantage of the State than it would if adopted in the business affairs of individuals or corporations.

The Experiment Station has not only been of service through its re-

search work, but has also materially aided in winning the war by virtue of its activities in honestly and fearlessly enforcing the pure feed law of the State. Had it not prevented the misbranding and adulteration of cotton seed products alone, the feeders of this State would have paid immense sums of money for cotton seed hulls at the price of cotton seed meal. This unnecessary charge would have been transmitted on and on until in the purchase of the finished animal products and by-products, the ultimate consumer, or society at large, would have footed the bill. It should be perfectly obvious that if the feeder should have had to stand the loss, there would not have been the impetus to animal production which was necessary in order to feed ourselves and our Allies during the period of the war.

In order that a dollar's worth of cotton seed meal might actually be delivered for each dollar invested, the Feed Control Service took the pains to inspect and sample each and every car of cotton seed meal and cake that was ordered through the State Food Administrator, make analysis of the sample, and send copies of the analysis to the State Food Administrator, the manufacturer, and the buyer. In fairness to all concerned, adjustments were made on the basis of the analysis.

While we are not unmindful of the incomplete state of development of the Texas Station, it is a matter of pride to its staff—and should be the pride of the State—that this was one of the several Stations which were not found wanting when the critical hour appeared. It may be interesting to note that the Agriculture Committee of the National Research Council, in its efforts to place every experiment station, not already so, on a war basis, found few if any suggestions involving changes in the nature and scope of our investigation work. In fact, this Station has been congratulated upon the fact that its work prior to the war was on a war basis. This condition was due to the fact that this Station has ever had in view the importance of restricting its activities to the more important problems confronting the farmers and stockmen of the State. The war has presented opportunities to the Station, not only in the matter of furnishing an outlet for the information which it has accumulated through investigation, but also because of the fact that it has caused farmers and stockmen to realize quite fully, for the first time, the necessity for such information as the experiment stations yield. Then, too, the intensity of this demand for agricultural information has brought the Station staff into a more intimate relation with the farmers and stockmen than was at all possible prior to the war. Previously it was necessary for the Station men to go out among the farmers and stockmen and study their problems, regardless of the fact that the farmers and stockmen themselves, in many instances, were not at all alarmed at the difficulties confronting them.

SOIL SURVEYS

Realizing that soil surveys are prerequisite to the most advanced types of investigation pertaining to farm problems, this Station has co-operated quite closely with the Federal Bureau of Soils for a number of years. The attention of the Thirty-fifth Legislature was called to the important relation of soil surveys to the development of Texas agriculture and, accordingly, an initial appropriation of \$7500 per annum

was made for continuing soil surveys in Texas, in cooperation with the Bureau of Soils of the United States Department of Agriculture. During the past year a number of surveys have been made under the existing cooperation. Surveys of Bowie, Red River, Denton and Freestone counties have been completed, and surveys of Dallas, Tarrant and Erath counties have been begun.

Soil surveys are not only essential to accuracy in conclusions pertaining to the possibilities for agricultural development, but they are of immediate service to every farmer in the proper tillage and utilization of the soils on his farm. They will also be of intrinsic service in relation to the matter of land settlement. It is only a matter of time until the undeveloped sections of Texas will be settled, by one means or another. As in the past, this may be accomplished through private colonization schemes operated in a manner favorable to the general welfare. And it is proposed, of course, by Governor Hobby and Secretary Lane, that some method of public land settlement be adopted. These proposals have caused a rather close study to be made of tenure in relation to size of holdings throughout the world. There is some reason why France and some parts of Germany are areas of small land holdings, and England, notwithstanding the crowded conditions there, is a country of large estates. Considering these conditions, together with the differences between American social and economic conditions and those prevailing in the European countries, it should be possible for the State of Texas to determine a system of land settlement that will work to the best interests of the State. Whenever a definite course of action is decided upon, a soil survey will prove to be the first demand, as has been the case in Wisconsin, California, and other sections in which the land has been settled either by public endowment or private colonization.

ANIMAL INDUSTRY

Heretofore, this Station has been handicapped in its effort to conduct a sufficient number of investigations in animal industry to satisfy the principal requirements of the various types of stockmen. Until recent years the principal work in animal industry has been limited largely to feeding experiments with swine, steers and dairy cattle. Very little breeding work has been accomplished. Furthermore, there was no experiment farm located in the region particularly suited to sheep and goats, so that very little sheep and goat work has hitherto been accomplished. It is pleasing, therefore, to be able to report that during the past few years the Station has secured lands and equipment for feeding, breeding and veterinary work with practically every type of farm animal. The work with dairy cattle, swine and poultry is conducted on the Feeding and Breeding station near the College. This Station was established in 1912, and at the present time is in a very satisfactory state of development. Owing to the limited acreage and the prevailing climatic conditions, it is not possible to conduct work here with the Angora goat, the different breeds of sheep, or with beef cattle except in steer feeding.

The second acquisition was equipment for sheep breeding work at Substation No. 7, near Spur. This, however, is under small farming, rather than typical sheep and goat range conditions.

The next step was to secure a range station, in the Edwards Plateau country, which is suited to all kinds of live stock, but particularly to cattle, sheep and goats. This Station was located on the Sutton-Edwards county line, twenty-five miles south of Sonora. Credit for securing the necessary funds and for fostering the proposed station up to the point of its successful establishment is due the membership of the Sheep and Goat Raisers' Association of Texas. In December of 1915, the sheep and goat raisers met at Del Rio, Texas, to discuss the advisability of organizing an association, and at this meeting resolutions were passed asking the Legislature to establish an Angora goat station and to provide funds for the purchase of lands and equipments. This resulted in an appropriation of \$5000 per annum for two years, by the Thirty-fourth Legislature, an amount altogether inadequate for the purpose. In order to make possible the purchase of a site therefore the sheepmen and goatmen of Sutton, Edwards, Kerr, Val Verde, and adjacent counties, donated a fund of \$8000 in cash to be used by the Governing Board to supplement the State appropriation for the purchase of a site. Five sections of land were purchased, but under the conditions, no developments were possible until a succeeding Legislature could provide the funds. The Thirty-fifth Legislature provided an appropriation of \$39,106.94 for the first year and \$14,180 for the second year of the biennium ending August 31, 1919. The funds thus appropriated have been economically expended in the development of permanent fences, barns, sheds, wells, and equipment usually found on a range station. In accordance with the provisions of the appropriation, breeding herds of sheep, Angora goats and beef cattle have been established and are being increased in numbers as fast as possible.

This station presents not only ideal conditions for the study of the feeding, breeding and management of sheep, goats and cattle under the particular conditions prevailing in the Edwards Plateau country, but will also enable the station to make studies pertaining to the economical utilization of the ranges. Such studies include the kinds, numbers and proportions of sheep, goats, cattle, and horses which may be carried continuously on a given range, with best results, both in the matter of meat, wool, and mohair production and the preservation of maximum grazing on the ranges themselves. Many other lines of work might be suggested, but it is sufficient to say that this station, the first of its kind to be established in the United States, if not in the world, shall serve as a nucleus of investigations in animal industry covering every range problem of importance.

NEW BUILDING

It is pleasing to note that the new Experiment Station building, proposed several years ago, because needed even then, is in fair way for early completion. This building, being equipped to meet the laboratory requirement of the several divisions, will undoubtedly prove to be the greatest impetus that agricultural research has ever had in Texas. By virtue of the superior work which may be conducted in the laboratories of this building, the character of the work of every division of the Station should take first rank among that of the leading experiment stations of the country.

THE WORK BY DIVISIONS

Inasmuch as this publication comprises two definite annual reports, the work of the various Divisions for the two-year period is outlined without reference to the years. Detailed results will be given in bulletins and circulars as from time to time the facts at hand warrant publication. The following is a brief statement of the work under way:

Veterinary Science

"*Infectious Anaemia* of Horses and Mules," Adams fund. This is a serious disease of horses and mules which has baffled investigators as to means of control. Since the disease causes heavy losses of work stock, its control is of great importance to the State.

"*Swell Head* of Sheep and Goats," Adams fund. This is a serious disease in the sheep and goat-raising sections of the State, and its study was begun at the request of the sheep and goat raisers of the State.

"*Loin Diseases* in Cattle in the Coastal Plains of Texas," Hatch fund. This is an obscure, and highly fatal, disease of cattle, which has so far not yielded to investigation, but because of its seriousness, it is being studied further.

"*Stomach Worms* in Sheep and Goats," Hatch fund. Investigations are under way to determine the influence of the stomach worms on the health of the animal, and to develop practical means of control.

"*Texas Fever*," State funds. The well-known work of the Division in the inoculation of cattle against Texas Fever, or "tick fever," is being continued, with the usual success. This work has been greatly facilitated during the past year by the provision for a model and adequate barn for the cattle being treated, as well as for the storage of feeding stuffs.

"*Unknown Diseases* of Sheep and Goats," State funds. In Western Texas there are a number of diseases of sheep and goats which are apparently unknown to animal pathologists. These diseases are being studied with a view to determining their character and developing control measures.

"*Abortion* in Sheep and Goats," State funds. Considerable losses occur in Texas from abortion in sheep and goats, and these investigations are designed to determine the causes of this abortion and to perfect means of control.

The work of the Division has been greatly strengthened during the past year by the fact that the State Legislature allowed appropriations for a model barn for Texas fever work, an anthrax serum laboratory, and expenses for operating and equipment, which were very much needed.

Chemistry

"*Soil Studies*," Adams fund. Investigation of the fundamental properties of soils, particularly with reference to phosphoric acid, potash and humus of the soil and its nitrifying and other biological properties.

"*Nutritive Values* of Feeds," Adams fund. Study of (a) the productive values, (b) the proximate composition, (c) the digestibility of the proximate constituents of feeding stuffs.

"Fertilizer Studies," State funds. Composition, properties, and agricultural values of fertilizers, fertilizer materials and ingredients, and experiments relative to the value of fertilizers, including value of fertilizers on various types of soil, and their needs for fertilizers.

"Soils," Hatch fund. The composition and properties of various types of soil found within the State.

"Human Food," Hatch fund. The composition, properties, and utilization of plants and plant products as human food.

"Analyses of Feeding Stuffs for the Feed Control Service." Feed Control Service funds. The Chemist of the Experiment Station is Chemist for the Feed Control Service and does the official analytical work required in the enforcement of the pure feed law.

"Adulteration of Feeds," Feed Control Service funds. The composition and adulteration of feeding stuffs, including methods.

"Fertilizer Control, Administration, Inspection, Analyses, and Methods of Analysis," State funds. By law, the Chemist of the Experiment Station is also State Chemist and as such is charged with the enforcement of the State law regulating the sale of commercial fertilizers and poisonous insecticides in the State.

"Miscellaneous Analyses of Waters, Soils, Minerals, and Miscellaneous Substances," State funds.

Horticulture

"Plant Breeding, Using Blackberries and Dewberries, genus *Rubus*." Adams fund. Hybridization of blackberries, dewberries and raspberries, with the object of obtaining new and improved varieties for cultivation, and to study the laws that govern variation and hybridity in these plants.

"Longevity of the Indian Peach," Hatch fund. Studies of the longevity, adaptability, and other qualities, of the old-fashioned Indian cling peach, as compared to the modern commercial varieties.

"Studies of Grapes," Hatch fund. Studies of the *Vitis vinifera* when grafted onto the roots of some of the more hardy native Texas grapes, with the view of developing, if possible, a more suitable variety for cultivation under Texas conditions.

"Tests of Introduced Fruits," Hatch fund. Under this study an orchard is maintained for the study of the adaptability of fruits introduced into the United States. Large numbers of newly introduced fruits and shrubs are secured each year from the Federal Government, which are tested out in this orchard, and definite studies are made of each introduction.

"Field Experiments with Crown Gall," Hatch fund. A comprehensive study of this nursery disease, which has ruined thousands of trees each year in Texas for many years. The object is to find a means of control or prevention of the gall and to determine whether or not there is a practical remedy for it.

"Arboretum of Forest Trees," Hatch fund. This arboretum is maintained for the purposes of finding the species of forest trees most suitable for shade, ornamental, and other purposes, and as windbreaks for live stock.

"Pecan Stock Investigations," State and local funds. This work is being done by the Professor of Horticulture in the College, under the

terms of cooperative agreement with the School of Agriculture. The objects are (a) to determine the relative vigor and hardiness of pecan stock from the planting of the seed until the stock is large enough to be worked; (b) to determine the effect of the stock upon representative varieties of pecans as to hardiness, ease of propagation, early bearing, productiveness; (c) to determine the effect of climate and soil upon pecan stock.

Animal Industry

FEEDING INVESTIGATIONS.

"Feeding Baby Beeves," State and local funds. With a view to determining as nearly as possible the best methods of fattening calves for market, or the production of baby beef; making comparisons of cold-pressed cotton seed and peanut meal for supplementing a ration composed of ground milo, corn or sorghum silage, and Sudan grass hay, for fattening cattle; and the comparative feeding values of Sudan grass hay and cotton seed hulls.

"Fattening Hogs," State and local funds. To compare a ration of straight milo chops with milo chops supplemented with cotton seed meal; the feeding values of milo chops and cotton seed meal when dry, wet, self-fermented, and when used with copperas in self-feeder; light and heavy feeding of cotton seed meal; cotton seed meal and meat meal as supplements to milo chops; ground milo with whole or unground milo; and to determine the efficiency of the protein in cotton seed meal in comparison with protein in meat meal.

"Fattening Yearling Steers," State and local funds. The object of this experiment was to determine the relative values of cold pressed cotton seed and ground whole pressed peanuts for supplementing the basal ration of milo chops, sorghum silage and Bermuda hay, for fattening. Forty-one high-grade Hereford yearling steers, divided into two lots, were used.

"Fattening Two-Year-Old Steers," State and local funds. The object of this experiment was to compare cotton seed meal and peanut meal (pure) for supplementing a basal ration of milo chops, sorghum silage, and Bermuda hay, for fattening steers. Thirty-four high-grade two-year-old Aberdeen-Angus steers were used.

SHEEP AND GOAT BREEDING INVESTIGATIONS

"Sheep Feeding and Breeding," State funds. (a) To determine which of the most common breeds of sheep when crossed onto fine-wooled ewes will produce the most thrifty and desirable lambs when grown and fattened under Texas conditions, breeding pure-bred rams of Rambouillet, Southdown, Shropshire, Hampshire and Lincoln breeds, and a half-blood Karakule ram, to Rambouillet ewes; (b) to compare cotton seed meal with hulled peanut meal when fed to sheep as a fattening ration; (c) to determine whether "broken-mouth" ewes can be profitably purchased from range flocks of Western Texas, removed to farm, and bred to rams of mutton breeds and the resulting lambs fattened and marketed within a year; (d) to determine whether aged ewes dropping lambs in January and February can profitably be handled under farm conditions.

"De-tailing, or Docking Lambs," State funds. To determine whether the de-tailing, or docking, of young lambs by means of the hot-searing pincers can be practiced with as effective and satisfactory results as by the use of the ordinary knife.

"Amount of Shrink as Result of Dipping Sheep," State funds. To determine whether the dipping of sheep in any of the recognized dips is deleterious to the sheep during the time immediately following the operation.

"Lamb Feeding, Sheared versus Unsheared," State funds. To determine and compare the gains made by sheared and unsheared lambs when fed on identical fattening rations over a feeding period of 126 days.

In addition to the work outlined above, a great deal of development work for the sheep and goat experiments has been done at the substation at Spur and at the Angora goat and sheep substation near Sonora.

SWINE INVESTIGATIONS

"Investigations of Pork Production," State and local funds. (a) To determine which forage crops are best adapted for pork production in Texas; (b) to compare grain-forage methods of making pork with the grain-dry lot method; (c) to determine the cost of growing a fifty-pound pig with and without forage; (d) to determine the cost of keeping brood sows a year, both with and without forage.

"Swine Feeding Investigations," State and local funds. (I) To determine (a) the value of peanuts grazed for pork production; (b) the effect of whole peanuts on pork and lard when grazed by hogs; (c) the effects of different rations on the pork and lard after softening by peanuts; (d) whether or not a grain ration fed in connection with peanuts will prevent the flesh and lard from getting soft; (e) whether or not hogs can be hardened profitably with a grain ration after they have been made soft with peanuts; (f) to determine and study the melting points of the lard taken from the hogs of the various lots used in the test.

(II) To determine (a) the value of peanut meal both with and without the hull, when used as a supplement to milo chops in a ration fed to hogs; (b) to compare peanut meal with tankage and cotton seed meal as supplements to milo chops; (c) to compare a "narrow" peanut meal-milo ration with a "balanced" ration of peanut meal and milo; (d) to study the effect of peanut meal on the quality of the pork and lard.

"Special Investigation of Soft Pork," State, Hatch, and local funds. To (a) standardize fresh and cured pork on basis of firmness, into classes, such as, for example, hard, firm, medium, soft, oily; (b) ascertain the extent of correlation between melting point of lard and the firmness of pork; (c) determine the extent of correlation between firmness of the body of the live hog and the firmness of the pork from the hog; (d) follow the changes in quality of pork through different feeding periods on softening and hardening feeds; (e) perfect instruments for satisfactory extraction of small samples of fat from live hogs; (f) perfect an instrument for use in grading pork on the basis of firmness.

"Study of the Application of Standard Testing Apparatus for Use in Grading and Classing Pork." State, Hatch, and local funds. This work

is conducted in the highway testing laboratories of the Civil Engineering Department, School of Engineering of the College, under the leadership of an Associate Professor of Civil Engineering. The object of this investigation is (a) to study methods of preparing and preserving meat samples for testing purposes; (b) to study the application of the Dow penetrometer, or modification of that instrument, for testing the resistance to penetration offered by the connective tissue in various classes of pork; (c) to study the application of the Vicat apparatus, or modification of the apparatus, for testing the firmness of pork; (d) to investigate the application of other testing methods with the view of using them for pork testing, and (e) to make tests upon numerous designated meat samples, in order to establish by testing methods a definite dividing line between the several market classes of pork.

"Study of the Histology of Pork Fat," Hatch and local funds. To determine (a) the relative size of fat cells in hard and soft pork, (b) the thickness of cell walls of fats from hard and soft pork, (c) the relative amounts of muscular and connective tissues in hard and soft pork, (d) what difference exists in the connective and muscular tissues of hard and soft pork, and (e) to study the general histology of pork fat in its relation to the quality of pork. This work is being carried in co-operation with an Associate in Biology of the School of Agriculture of the College, under the cooperative agreement.

"Swine Feeding Investigation," State funds. (a) To obtain additional data on feeding cotton seed meal to hogs; (b) to compare peanut meal, tankage, cotton seed meal, wheat shorts, and cocoanut meal as supplements to corn in a fattening ration for hogs; (c) to determine the most economical amount of peanut meal to feed in the ration; (d) to determine what feeds will make soft or "oily" pork.

"Perfection of Pork Grading Instruments," State, Hatch, and local funds. (a) To design an instrument for use in coolers to rapidly grade pork on the basis of firmness, (b) to make a working model of the instrument; (c) to apply the instrument in the cooler, standardizing it to grade on the basis of agreed grading line. This work is being done in the shops of the Mechanical Engineering Department of the College, by the Professor of Mechanical Engineering, and will be tested in coolers of the pork packing establishments.

"Influence of Water Consumption on Quality of Pork," State funds. The object of this investigation is to (a) determine whether or not a restriction in the amount of water consumption will yield a pork of different firmness from that produced where water consumption is at a maximum; (b) ascertain if the water consumption variation bears any relation to the quality of the pork produced; (c) make studies on the water content of pork of different qualities.

Entomology

"Study of the Life-history, Habits and Bionomics of the Turnip Louse, Together with Attention to the Development of Control Measures," Hatch fund. To determine the length of the various stages in the life-history of the insect in its relation to plant foods, to determine its seasonal history, and to perfect control measures, thereby providing a means of saving the truck growers of Texas from heavy losses each year, due to the depredations of this insect pest.

"Life-history, Habits and Bionomics of the Harlequin Bug, with Attention to Control Measures," Hatch fund. To determine the length of the various stages of the life-history of the insect, its habits in relation to plant foods; to determine its seasonal history, and to perfect control measures.

"Study of Weevils Infesting Peas and Beans," Hatch fund. A determination of the various insects infesting peas and beans in Texas, both in field and in storage; the effect of temperature on the various species, and the development or improvement of control measures.

"Bionomical, Morphological and Systematic Study of Aphids," Adams fund. To determine (a) the species that occur in Texas and the life cycle of each, with special reference to alternate food plants of some of the most important species; (b) the factors which influence the formation of wings in aphids; (c) a systematic study of the genus *Aphis*.

"Study of the History, Habits and Control of the Sweet Potato Weevil or Borer," Hatch fund. To determine by cage studies the details of the life-history of this insect. The study will be supplemented by field studies, to determine the life cycle in the different localities, and attention will be paid to the development of satisfactory control measures.

"Study of the Green Bug or Spring Grain Aphis," State funds. This work was done by the Acting Professor of Entomology in the College, under the terms of the cooperative agreement with the School of Agriculture.

"Life-history and Methods of Control of the Pecan Twig Girdler," College funds. This study is being made by the Acting Professor of Entomology in the College, also under the terms of the cooperative agreement with the School of Agriculture, and the investigation is planned to determine the life-history of the insect, as well as methods of control.

"Study of the Life-history, Habits and Control of the Principal Insect Pests of the Peanut," Hatch fund. To determine by cage studies the life-history of the principal insect pests of the peanut. These studies will be supplemented by field studies, to determine the seasonal history of the pests, and studies will be made in different localities, in addition to the seasonal notes made at the Main Station. Efforts will be made to develop and perfect control measures.

"Studies of the Pecan Bud Moth," under the cooperative agreement with the School of Agriculture of the College, at no expense to the Station. This work will also be conducted by the Acting Professor of Entomology, and the object is to study the life-history of the moth, and ascertain methods of control.

The Entomologist of the Experiment Station is named by law as State Entomologist, and as such, under the direction of the Director, has charge of the enforcement of the foul brood law in Texas. Rules and regulations are issued from time to time, and the work of eradication of foul brood in honey bees is progressing in a very satisfactory manner.

Agronomy

"Rate and Distribution of Seed and Time of Thinning Cotton," Hatch and State funds. To determine (a) what effect varying environment, as represented by rate and distribution of seed and time of thin-

ning, has on the development of the plant and its characters; (b) what effect different spacings of plants in the row have on production, quality and market value of the crops; (c) whether or not a different distribution of plants has any effect on yield or quality of the crop; (d) the effect of deferred thinning on production.

"Crop Variety Test," State funds. To compare varieties and strains of the various farm crops of different classes for productiveness, quality, and other desirable characters. This includes the testing of corn, cotton, grain sorghums, legumes, sorghos, Sudan grass, and similar crops.

"Crop Improvement," Hatch and State funds. With the object (a) of the selection and testing of individual plants with a variety of species, and the propagation of such strains where desirable; (b) the study of pure lines so developed, with a view to interpreting the value of visible characters.

"Selective Inbreeding in Grain Sorghums and the Influence of Environment on the Plant," State and Hatch funds. To establish certain head types and to correlate the characters involved with each other and with productiveness; to determine the effect of environmental influences on the characters of the plants.

"The Effect of Environment on the Development of the Rice Plant," State funds. With the object (a) of studying the effect of water, in the form of either soil moisture, surface water, or water vapor, on the development of the rice plant; (b) the effect of varied temperatures on the rice plant, whether such temperatures exist in the soil, the surface water, or the air; (c) to determine the effect of wind movement on fertilization of the rice plant; (d) to study the effect of light on the development of the architecture of the rice plant.

"Oat Investigations," State and Hatch funds. To determine by experimental methods the highest yielding, the best adapted, and the most desirable oat for each locality. The information thus secured will be used to determine varieties best adapted to counties adjacent to the substations at Temple and Denton, and College Station, where this work is being conducted, or for counties in any part of Texas where the oat can be grown with profit.

"Study and Improvement of the Peanut," State funds. This work is conducted on the grounds of Substation No. 11, near Nacogdoches, under the supervision of the Division of Agronomy, by the Superintendent of the substation. Object: (a) the improvement of the peanut plant in productiveness, quality, and other desirable characters, this study embracing not only the composition as regards nutrients contained, but also such qualities as the color of the seed coat, which may effect the value of the kernels for commercial purposes; (b) study of the peanut plant; its habits of growth; methods of production, and soil and fertilizer requirements; with the view to increasing the yield, quality, and market value of the strains developed.

"Time and Method of Intertillage," State and Hatch funds. To secure data as to the effect of intertillage and cultivation and presence and non-presence of weed growth, on the yield, nature, development, structure, composition, quality, utility, and ease of working of soils, and the moisture and other constituents of the soil, and their availability.

"Time and Method of Seed Bed Preparation," State and Hatch funds.

To secure data as to the effect of plowing, tillage, presence and non-presence of weed growth, on the yield, nature, development, structure, composition, quality, utility, and cost, of crops; and the moisture and other constituents of the soil, and their availability. Field work is being done at the Main Station and at the substations.

"Rotation, Fertilizer and Soil Improvement Investigations," State and Hatch funds. To secure data as to the effect of the application of fertilizers, amendments, manure, green manure, and other substances, on the soil, and the effect of rotation, crop sequence, and crop management practices, on the soil; and as to the effect of drainage, irrigation, and other practices, on the soil; and to secure data as to the effect of these treatments or practices on the moisture and other constituents of the soil, and their availability; and on the structure, nature, utility and ease of working, of soils, and the presence and non-presence of weed growth; and on the yield, nature, development, structure, composition, quality, utility, and cost of crops grown on such soils.

"Plant Introduction," State and Hatch funds. The object of this work is to test the relative merits of newly introduced field crops. New introductions are tested not only for their agronomic and other practical values, but also for possible values in breeding work.

"Composting Raw Phosphate Rock and Sulfur with Different Soils," Hatch, State and Council of National Defense funds. In accordance with a centralized plan announced by the Chief of the Office of Experiment Stations at Washington, acting in conjunction with the Council of National Defense, this project is being studied in several States under the general title of "Cooperative Experiments upon the Composting of Phosphate Rock and Sulfur." The object is to compost raw phosphate rock, and sulfur with Lipman's starter in several types of Texas soil, and observe the results produced in terms of (a) available phosphates, (b) plant growth produced when using the compost as a fertilizer.

Plant Pathology and Physiology

"Pink Root of Onions," Hatch fund. Pink root is a disease which causes heavy losses to the onion-growing sections of the State. The object of this investigation is to discover the cause of the trouble and to devise practical methods of control. It is intended also to study other onion root diseases which may be directly or indirectly associated with pink root. The field work is being done at Laredo, and the laboratory work at the Main Station.

"Diseases of the Watermelon and Their Control in Texas," Adams fund. A comprehensive study of the causes of failure of the watermelon crop, with a view to (a) devising scientific but practical methods of control by thorough investigation and determination of the causes of failure of the crop in Texas; (b) determining the cause of the sudden blighting of the melons at a stage when the plants seem to reach maximum growth; (c) determining the relationship of the sudden blighting to the disease known as "anthracnose"; (d) determining the cause of blossom-end, or nose-end, rot; (e) determining the life-history, physiology and morphology of *Collectrichum lagenarium*, and the organism which causes blossom-end rot; (f) determining the pathological morphology, physiology, and cytology, of the affected host;

(g) working out any other root, foliage or fruit trouble that may be new, and of economic importance, bearing in mind especially the cotton root rot disease; (h) determining the relationship of the organisms which cause disease in watermelons, to those of the cantaloupes, squash, pumpkin, and other ornamental cucurbits; (i) determining the relationship of climate to severity of the disease, by means of weather and hygrothergraphic studies; (j) developing resistant strains of varieties; (k) determining the advisability of spraying as a practical means of control; (l) determining the field methods and practices which tend to keep in check, or to increase, the diseases of the watermelon and other cucurbits. This work is being carried out at Prairie View, in cooperation with the State Normal and Industrial Institute branch of the institution, where land, care, and labor on plants are donated by that Institute.

"Diseases of the Sweet Potato and Their Control in Texas." Adams fund. To determine the diseases of the sweet potato in Texas, with a view to devising methods of control. This project aims, further, at investigating present storage methods, in order to devise better means of keeping potatoes, to prevent loss from rot. The particular troubles to be investigated first are "pox" and "blackleg," and in addition, such other troubles as may be encountered.

"Texas Root-Rot Investigations," Adams fund. To discover the cause or causes of Texas root-rot disease of cotton, sweet potatoes, alfalfa, cowpeas, and other plants, with a view to developing methods of control. This work is being conducted at the substation near Temple, and the laboratory work is being done at College Station. It is planned (a) to determine the role of the fungus *Ozonium omniverum* in producing the root-rot, by inoculation studies with pure cultures of the fungus in both greenhouse and laboratory, and also in the field under natural conditions; (b) to work out the life-history of the fungus, with a view to determining the various stages of the parasite; (c) to determine the range of various hosts susceptible to the fungus, confining such studies to cotton, sweet potatoes, alfalfa, and other truck or fruit crops that may be of assistance in solving the problem; (d) to determine the effect of weather and various cultural methods in increasing or decreasing root-rot; (e) to study other root-rot parasites which are mistaken for Texas root-rot; (f) to determine the advisability of treating infected soils with chemicals; (g) the development of strains or varieties of affected crops which may be resistant to the root-rot.

Poultry Husbandry

"Comparing Cotton Seed Meal, Meat Scrap and Sour Skimmilk as Sources of Protein for Fowls," State and local funds. The object of this test was to secure information as to the most economical source of protein for poultry feeding.

"Feeding for Egg Production," State and local funds. To determine (a) whether or not rations composed entirely of vegetable feed can be fed as profitably at rations composed in part of animal feed; (b) to determine the relative values of skimmilk, cottonseed meal, meat scraps, and peanut meal for poultry feeding.

"Egg Preservation," State and local funds. To determine whether or not it is profitable to preserve eggs for home use.

"Cockerel Fattening," State and local funds. (a) To determine whether or not it is profitable to fatten surplus cockerels for the market; (b) to ascertain the length of time poultry can be fed with profit to the feeder; (c) to determine the amount of flesh that can be added to each 100 pounds of live weight, with profit to the feeder; (d) to determine the cost of each pound of weight added; (e) to study the relative shrinkage between fattened and range cockerels when shipped to market.

"Fowl Fattening," State and local funds. (a) To determine whether or not it is profitable to fatten cull pens for market; (b) to determine the length of time such fowls may be fed with profit; (c) to determine the cost of each 100 pounds of live weight added with profit; (d) to determine the cost of each added pound, and (e) to determine the relative shrinkage between fattened and range hens when shipped to market.

"Comparison of Dry Mash and Wet Mash for Poultry Feeding," State and local funds.

Considerable progress has been made in the erection of buildings, the laying out of plats for grazing crops for poultry, and in securing equipment.

Forestry

"Introduction and Propagation of Forest and Shade Trees in Different Regions of Texas," State funds. This work is being carried at the various substations, with the view to determining which native American and exotic trees are most suitable to introduce into the widely varying soil and climatic conditions of Texas, for fence posts, shelterbelts, fuel, and shade purposes; and under what methods of pruning, spacing, and general nursery practice and planting methods, the best results in growth, form, and vigor may be expected.

The Forester of the Experiment Station is also State Forester under the law.

Dairying

"Value of Peanut Meal as Compared to Cotton Seed Meal When Fed to Dairy Cows," State and local funds. This work was conducted on the Feeding and Breeding Substation, near the College. The object of the investigation was to ascertain the influence of peanut meal upon milk production, as compared to cotton seed meal, to note the difference in the feed cost of milk production as between these two products, and to discover any physiological objections which may be found in connection with peanut meal as a dairy feed.

"Cotton Seed Meal vs. Cocoanut Meal for Dairy Cows," State and local funds. To (a) compare the relative milk-producing value of cotton seed meal and cocoanut meal; (b) ascertain the relative effects of cocoanut meal and cotton seed meal on the percentage of butter-fat; (c) ascertain the relative effects of cocoanut meal and cotton seed meal on butter-fat production.

"Cotton Seed Meal vs. Peanut Meal," State and local funds. (a) To compare the relative value of peanut meal and cotton seed meal for milk production when fed to dairy cows; (b) to compare the palatability of peanut meal and cotton seed meal for dairy cows; (c) to com-

pare the value of peanut meal and cotton seed meal for butter-fat production; (d) to make note of any difference in physiological effects of the two feeds, or any other observations of value.

"Methods of Preparation of Velvet Beans for Dairy Cows," College funds. This work is being conducted at the College dairy plant under the co-operative agreement with the School of Agriculture, under the supervision of the Professor of Dairying, in the College. The object is (a) to compare the influence of methods of preparation of velvet beans on milk production; (b) to compare the influence of methods of preparation of velvet beans on percentage of butter-fat and butter-fat production; (c) to study the influence of methods of preparation of velvet beans on palatability.

In addition to the work outlined, considerable work of a development nature has been done. A foundation herd of Jerseys has been acquired, and progress has been made in the matter of getting the Division of Dairying firmly established.

Plant Breeding

"Fundamental Study of Inheritance in Cotton," Adams and State funds. A determination of the Mendelian unit characters in inheritance in cotton, or their behavior in inheritance, so as to produce various desirable combinations, such as earliness and prolificacy, drouth resistance and earliness, disease resistance and earliness, storm-proofness and earliness, and so forth. At first only one pair of characters will be studied and later on two pairs of unit characters will be studied at the same time. In order to make the work more thorough and comprehensive in scope, it is the plan to make comparative studies of the unit characters of given varieties and species upon different soil areas in the State.

"Oil Inheritance in Cotton" is being carried under the Adams and State funds as a sub-project of the cotton inheritance investigation. The object of this sub-project is the establishment of strains of cotton which give high or low oil analysis, and the collection of data that will assist in the unit character investigations. The work is also expected to furnish strains of cotton of commercial value. Pure line selection and hybridization, based on oil analysis, and guided by correlations and regression studies of parents with offspring, will be made. The hybridization will necessarily wait until pure biotypes for oil production are produced. The Chemist of the Station will make the chemical analyses.

Feed Control Service

The Twenty-ninth Legislature of Texas passed an act—

- (1) Regulating the sale of concentrated commercial feeding stuffs and the materials from which they are manufactured.
- (2) Defining them.
- (3) Prohibiting their adulteration.
- (4) Providing for their correct weighing and marking.
- (5) Providing for the collection of samples.
- (6) Providing for the expenses of enforcing the law.
- (7) Fixing penalties for violations.
- (8) Empowering the Director of the Agricultural Experiment Station (a) to adopt standards, names and definitions; (b) to refuse regis-

tration of any feeding stuff under a name which would be misleading as to the materials of which it is made up, or which does not conform to the standards, names and definitions in effect; and (c) after ten days' notice, to cancel such registrations as may be from time to time found in violation of the law, or contrary to the names, standards and definitions adopted by the Director.

The purpose of the Feed Control Service, which is operated as a Division of the Experiment Station, is to afford protection alike to buyers and sellers of feeding stuffs. The seller is protected by the development of uniform standards which eliminate unfair competition. He is expected to comply with the law, not merely for the sake of compliance, but because in the long-run it is the wisest course. The seller who habitually complies with the law has the confidence of the feeders and the general public, and avoids the unnecessary expense and the unsavory reputation incident to prosecution for violating the feed law.

By a comparison of the constituents of the feeding stuff, from the information printed on the tax tag attached to the bag or parcel, the buyer of feeding stuffs is enabled to determine for himself which is the cheapest and best feed to use, his particular needs considered.

Annual bulletins are issued, giving the names, definitions and standards for various feeding stuffs, together with names of firms registered for the purpose of selling feeding stuffs in Texas; a list of the feeds offered, with their chemical composition as determined by the chemist for the Feed Control Service. Discrepancies in guarantees are also shown, and from these bulletins it is an easy matter for one to determine the correct nature and value of a given feed.

The Feed Control Service is continuously investigating problems which are encountered in the enforcement of the law, with reference to the feeding values of various feeds and feeding combinations. The results of these investigations are given to the people of the State from time to time through bulletins, circulars and reports.

SUBSTATIONS

In addition to the Main Station, the State owns and operates a system of substations, consisting of thirteen experiment farms located in as many agricultural regions of the State. As their name implies, they are subordinate to and a part of the Main Station. In the selection of sites for these substations, due consideration has been given to the need of outlying work within the several agricultural regions. The substations are as follows:

No. 1, Beeville, Bee County. Established originally for truck farming experiments, but modified in later years to include work in general agriculture.

No. 2, Troup, Smith County. Established primarily as a fruit substation, but now includes work with vegetables and field crops.

No. 3, Angleton, Brazoria County: Devoted to general crops and crop production problems under poor drainage conditions. Especial attention is being given to forage crops and plant introductions.

No. 4, Beaumont, Jefferson County. Primarily a rice station, but

the work has been extended to include problems pertaining to general farming.

No. 5, Temple, Bell County. Crop production and plant introduction studies are being made under root-rot conditions.

No. 6, Denton, Denton County. Originally a small grain substation, but the work has been extended to cover the various farm problems of the section.

No. 7, Spur, Dickens County. Devoted to dry-land farming in the eroded Plains region, and certain sheep feeding and breeding problems.

No. 8, Lubbock, Lubbock County. Devoted to dry-farming and irrigation problems in the South Plains. Special investigations in grain sorghum improvement are also being carried here, and plant introduction studies are being given special attention.

No. 9, Pecos, Reeves County. Devoted to irrigation under alkali conditions, and plant introduction studies.

No. 10, the Feeding and Breeding Substation, near the College, was located here in order to have the investigations in feeding and breeding as close as possible to the College. This substation is devoted to the feeding and breeding problems with live stock, particularly cattle, hogs and poultry. By virtue of its location, this substation is particularly beneficial to students of animal husbandry.

No. 11, Nacogdoches, Nacogdoches County. Originally a tobacco substation, but now includes work on various problems pertaining to the general agriculture of Eastern Texas.

No. 12, Chillicothe, Hardeman County. Operated in cooperation with the Office of Forage Crops, United States Department of Agriculture. Devoted to the various dry-land farming problems of this section of the State, and plant introduction.

No. 14, near Sonora, in Sutton and Edwards counties. This is the Angora goat and sheep substation, and is located in the heart of probably the greatest goat and sheep-growing region of the country. Much development work, preliminary to actual investigation, has been done on this substation.

For more detailed information as to the progress and work of the various substations, reference is here made to the annual progress reports of the substations, published as regular bulletins of the Station.

COOPERATION

In accordance with our fixed policy of cooperating wherever cooperation is mutually advantageous, the following memoranda of cooperation have been continued:

1. With the Office of Dry-Land Seed Distribution, United States Department of Agriculture, for cooperative work in the dissemination of seeds of dry-land crops suitable to Texas conditions. Under this arrangement large quantities of valuable seeds have been placed with

Texas farmers, and it is expected that this work will become especially important during the present war.

2. With the Office of Forage Crops, United States Department of Agriculture, (a) in the operation of Substation No. 12, Chillicothe; (b) in special forage crops studies by Professor S. M. Tracy, at the Angleton Substation, and (c) in general forage crops investigations throughout the State.

3. With the Office of Foreign Seed and Plant Introduction, United States Department of Agriculture, for the introduction, propagation and testing of newly introduced plants giving promise of becoming valuable in Texas.

4. With the Office of Cotton and Truck-Diseases and Sugar-Plant Investigations, United States Department of Agriculture, for general work on plant diseases in Texas, and for a plant disease survey of the State.

5. With the Office of Horticultural and Pomological Investigations, United States Department of Agriculture, for the propagation and distribution of rosaceous fruits in Texas.

6. With the Bureau of Soils, United States Department of Agriculture, for cooperative soil surveys in Texas.

7. With the National Council of Defense, in the prosecution of a study on the composting of raw phosphate rock and sulfur with different soils.

8. With the School of Agriculture of the Agricultural and Mechanical College, wherein Station men may give lectures to students and teachers may do cooperative investigation work on the Station. Under the terms of this cooperation, investigation work is being conducted in horticulture and entomology.

9. With the School of Engineering, this College, wherein certain of the professors may cooperate in agricultural studies involving engineering problems.

10. With the School of Veterinary Medicine of the College, wherein the Dean of the School of Veterinary Medicine heads the Division of Veterinary Science on the Station.

11. With the Extension Service of the institution, whereby Extension workers from time to time suggest to the Station the more important problems of the farmers and stockmen throughout the State. In this manner some of the most important investigations of the Station have been suggested.

PUBLICATIONS

The publications of the Station, as usual, have met with a very great demand, and have received a wide distribution. In addition to a mailing list of agricultural colleges and experiment stations, libraries, and scientific workers, to whom copies of all publications are sent, there is issued and distributed to all the names on all lists, a quarterly list of available publications. Requests are then made by the recipients for the publications desired. In this way, unnecessary and wasteful distribution of the publications is avoided. Wherever possible, however, publications are sent to all those who desire them.

The following is a list of publications issued, together with the number of copies in each issue, published during the past two years:

Name	Number copies printed	
Bulletin No. 194.....	10,000	
195.....	20,000	
196.....	10,000	
197.....	7,500	
198.....	15,000	
199.....	10,000	
200.....	10,000	
201.....	15,000	
202.....	12,000	
203.....	10,000	
204.....	8,000	
205.....	12,000	
206.....	12,000	
207.....	15,000	
208.....	15,000	
209.....	12,000	
210.....	15,000	
211.....	10,000	
212.....	10,000	
213.....	10,000	
214.....	15,000	
215.....	15,000	
216.....	6,000	
217.....	10,000	
218.....	9,000	
219.....	10,000	
220.....	10,000	
221.....	10,000	
222.....	10,000	
223.....	10,000	
224.....	20,000	
225.....	7,500	
226.....	8,000	
227.....	10,000	
228.....	3,000	
229.....	10,000	
230.....	10,000	
231.....	10,000	
232.....	6,000	
	<hr/>	433,000
Circular No. 17.....	10,000	
18.....	7,500	
	<hr/>	17,500
Control Circular "A".....	5,000	
"B".....	5,000	
	<hr/>	10,000

Eight separate issues of unnumbered press bulletins "Publications Available for Free Distribution," 30,000 copies to each edition.....		240,000	
			240,000
Twenty-ninth Annual Report.....			7,500
			<hr/>
Total printed copies.....			708,000

SUMMARY

Bulletins	39
Regular circulars	2
Control circulars	2
Press Bulletins	8
Annual Reports	1
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	48

The following is a complete list of the publications available for distribution at this time:

124. The Pecan Case Borer.
126. Active Phosphoric Acid and Its Relation to the Needs of the Soil for Phosphoric Acid in Pot Experiments.
128. Cotton Seed Meal as Human Food.
129. Studies of the Ammonia Soluble Organic Matter of the Soil.
141. Commercial Feeding Stuffs.
148. Report on Experiments with Citrus Fruits at the Beeville Substation.
159. Steer Feeding.
160. Commercial Fertilizers in 1912-13.
162. Composition and Digestibility of the Chloroform Extract of Texas Hays and Fodders.
163. Digestion Experiments on Men with Cotton Seed Meal.
164. Commercial Feeding Stuffs.
165. Ammonia-Soluble Inorganic Soil Colloids.
166. Digestion Experiments with Texas Feeding Stuffs.
167. Commercial Fertilizers and Their Use.
168. Commercial Fertilizers in 1913-14.
169. The Total Fatty Acids and Other Ether Soluble Constituents of Feedstuffs.
170. Texas Feeding Stuffs: Their Composition and Utilization.
171. Losses of Moisture and Plant Food by Percolation.
172. Sudan Grass.
173. The Composition of the Soils of the Texas Panhandle.
174. The Effect of Organic Compounds in Pot Experiments.
175. Distribution and Digestibility of the Pentosans of Feeds.
176. Commercial Fertilizers in 1914-15.
177. Commercial Feeding Stuffs in 1914-15. The Texas Feed Law.
178. Effect of Additions on the Availability of Soil Phosphates.
180. The Turnip Louse.
181. Oxidation of Organic Compounds in the Soil.
182. Steer Feeding.

183. Moisture Relations of Some Texas Soils.
184. Cooperative Fertilizer Experiments with Corn, 1908-14.
185. The Production Co-Efficients of Feeds.
186. Fattening Lambs.
187. Sprays and Spraying.
188. Tile Drainage.
189. The Composition of Cotton Seed Meal and Cotton Seed.
190. The Effect of Additions on the Availability of Soil Potash, and the Preparation of Sugar Humus.
191. The Composition of Rice and Its By-Products.
192. Soils of Grayson, Lee, McLennan, Titus, and Tyler Counties.
193. Commercial Fertilizers in 1915-16.
194. Commercial Feeding Stuffs, 1915-16.
195. Japanese Sugar Cane as a Forage Crop.
196. Digestibility of Sugars, Starches, and Pentosans of Roughages.
197. Progress Report, Substation No. 3, Angleton, Texas, 1909-14.
198. Feeding Baby Beeves.
199. Progress Report, Substation No. 6, Denton, Texas, 1909-14.
200. Progress Report, Substation No. 4, Beaumont, Texas, 1909-14.
201. Peanut Meal and Ground Whole Pressed Peanuts for Hogs.
202. Progress Report, Substation No. 12, Chillicothe, Texas, 1905-14.
203. The Productive Values of Some Texas Feeding Stuffs.
204. The Recurving of Milo and Some Factors Influencing It.
205. Sheep Breeding and Feeding.
208. The Fig in Texas.
209. Progress Report, Substation No. 2, Troup, Texas, 1909-1914.
210. Barns for Work Animals.
211. Field Experiments with Crown Gall, 1913-1917.
212. The Availability of Phosphoric Acid in Rock Phosphates.
213. The Composition of the Soils of South Central Texas.
214. Progress Report, Substation No. 1, Beeville, Texas, 1909-1914.
215. Progress Report, Substation No. 5, Temple, Texas, 1910-1914.
216. Commercial Feeding Stuffs, 1916-1917.
217. Commercial Fertilizers in 1916-1917.
218. Progress Report, Substation No. 7, Spur, Texas, 1909-1914.
219. Progress Report, Substation No. 8, Lubbock, Texas, 1909-1914.
220. Egg Producing Values of Some Texas Feeding Stuffs.
221. Progress Report, Substation No. 9, Pecos, Texas, 1910-1914.
222. The Composition of Peanuts and Peanut By-Products.
223. Effects of Lime and Carbonate of Lime on Acid Phosphate.
224. The Influence of Peanuts and Rice Bran on the Quality of Pork.
225. Coconut Meal vs. Cotton Seed Meal for Dairy Cows.
226. Cooperative Soft Pork Investigations.
227. Studies on the Harlequin Bug.
228. Influence of Peanut Meal on Quality of Pork.
229. Experiments at Substation No. 3, Angleton, Texas, 1909-1916.
230. Spacing of Rows in Corn and Its Effect on Grain Yield.
231. The Beemoth or Waxworm.
232. Mineral Requirements of Sheep.
233. Commercial Fertilizers in 1917-1918.
234. Commercial Feeding Stuffs in 1917-1918.

235. Cooperative Fertilizer Experiments with Cotton, Corn, Sweet Potatoes and Irish Potatoes, 1908-1917.

Annual Reports

Twenty-fifth, twenty-sixth, twenty-seventh, twenty-eighth, twenty-ninth.

Press Bulletin

"Broom Corn Culture," by A. B. Conner.

Circulars—New Series

3. Truck Farming in Texas.
7. Insect Enemies of Sudan Grass.
9. The Story of Three Pigs.
10. Housing Farm Implements (superseding No. 4).
12. Progress in Peanut Milling
13. The Green Bug or Spring Grain Aphis.
15. A Milk House for Texas.
16. Directions for Preparation of Veterinary Specimens for Examination.
17. The Texas Foul Brood Law and Foul Brood Regulations.
18. The San Jose Scale.

CORRESPONDENCE

The correspondence of the Station workers with farmers, stockmen and other citizens has again decreased during the years reported upon. for the reason that with the expansion of the Extension Service this work has been taken over very largely by that branch of the institution. This greatly relieves the Station workers and allows them more time for investigation and this has had a very marked effect upon the effective correlation of the researches and investigations under way, and has greatly facilitated the compilation and publication of results secured.

Accurate accounts of all letters sent out by the Station men is kept by months, and the following is a statement of these letters for the past two years:

1916-17	28,131
1917-18	28,487
Total for two years.....	56,618

STATION LANDS

The following is a statement of the lands owned by the State and devoted to Experiment Station work:

Location.	Owned by Station. Acres.	College land used for Station purposes. Acres.
Beeville.....	151.5	
Troup.....	150	
Angleton.....	157	
Beaumont.....	100	
Temple.....	96	
Denton.....	203	
Spur.....	160	
Lubbock.....	160	
Pecos.....	80	
Feeding and Breeding.....	265.8	543
Nacogdoches.....	82	
Chillicothe.....	100	
Sonora.....	3200	
Main Station Agronomy Farm.....		127
Veterinary Science Division of Main Station..		141
Totals.....	4905.3	811

Total number acres of land operated by Experiment Station...5716.3

DISTRIBUTION OF STATION PROPERTIES

The Texas Agricultural Experiment Station system includes the Main Station at the College and thirteen articulated substations in as many sections of the State. The Main Station comprises administrative officers and the offices, laboratories and greenhouses of the several specialists. In addition to these, there is an experiment farm, which is nothing more nor less than an outdoor laboratory, supplementary to the indoor work. The necessity for substation farms in the various agricultural regions of the State should be obvious. If all the Station work were confined to the central Station laboratories and farms at the College, the results would hardly be applicable throughout the State. The function of the substation farms, therefore, is to extend the work of the specialists at the central station to the various agricultural regions of the State. In this regard, the work of the Texas Station is better distributed, possibly, than that of any other State.

FINANCIAL STATEMENT

Following is a complete financial statement, for the two fiscal years reported upon, of all funds available for the purpose of the Station. The fiscal year for the Federal funds is from July 1 to June 30, while that for all other funds is from September 1 to August 31.

The administration of the Station, including the Director and his

entire staff, take great pride in handling the funds entrusted to them in an economical and efficient manner, and in keeping simple, yet complete records, showing the exact nature of each and every transaction.

Federal authorities inspecting the Station from year to year have repeatedly reported that the work here has a practical bearing upon Texas farm problems, that the money appropriated by the Federal government is spent in accordance with the law, and that the system of financial records employed is one of the best, if not the best, to be found in the country. Likewise, auditors employed by the Board of Directors for the annual auditing of State records, have again and again reported the Station system of accounting as being a very satisfactory one in every respect.

For convenience, the financial statement is divided into two sections; one for the year 1916-17 and the other for 1917-18, as follows:

FINANCIAL STATEMENT

Chief Clerk's Report, Texas Agricultural Experiment Station

RECEIPTS

From United States Treasurer for the year ending June 30, 1917, Hatch Fund.....		\$ 15,000.00
From United States Treasurer for the year ending June 30, 1917, Adams Fund.....		15,000.00
From State Treasurer for the year ending August 31, 1917, State Substations.....		135,000.00
From Main Station Treasury for the year ending June 30, 1917:		
Main Station Treasury.....	\$ 630.59	
Balance from previous year.....	572.00	
		1,202.59
From Substation Treasury for the year ending August 31, 1917:		
Substation Treasury.....	\$ 34,913.26	
Balance from previous year.....	1,543.96	
		36,457.22
Total.....		\$202,659.81

Government Hatch Fund for the Year Ending June 30, 1917

Hatch Fund	Dr.	Cr.
Received from the United States Treasurer.....	\$ 15,000.00	
Salaries.....		\$ 11,058.03
Labor.....		2,382.89
Postage and stationery.....		82.66
Freight and express.....		80.47
Heat, light, water and power.....		77.64
Chemical and laboratory supplies.....		106.31
Seeds, plants, and sundry supplies.....		157.29
Feeding stuffs.....		29.45
Library.....		30.02
Tools, machinery and appliances.....		292.69
Furniture and fixtures.....		37.00
Scientific apparatus and specimens.....		9.62
Live stock.....		24.00
Travel expenses.....		365.05
Contingent expenses.....		30.00
Buildings and land.....		246.88
Total.....	\$ 15,000.00	\$ 15,000.00

Government Adams Fund for the Year Ending June 30, 1917.

Adams Fund	Dr.	Cr.
Received from the United States Treasurer.....	\$ 15,000.00	
Salaries.....		10,075.35
Labor.....		1,866.12
Postage and stationery.....		31.21
Freight and express.....		161.00
Heat, light, water and power.....		314.10
Chemical and laboratory supplies.....		779.98
Seeds, plants, and sundry supplies.....		239.98
Fertilizers.....		2.10
Feeding stuffs.....		75.05
Library.....		15.30
Tools, machinery, and appliances.....		459.37
Furniture and fixtures.....		270.31
Scientific apparatus and specimens.....		200.00
Live stock.....		55.00
Travel expenses.....		189.70
Contingent expenses.....		
Buildings and land.....		264.69
Total.....	\$ 15,000.00	\$ 15,000.00

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1917.

State Substations.	Dr.	Cr.
Received from the State Treasurer.....	\$135,000.00	
Salaries.....		\$ 37,662.93
Labor.....		22,985.32
Publications.....		6,486.38
Furniture and fixtures.....		705.00
Office supplies.....		2,365.02
Freight and express.....		1,835.09
Travel expenses.....		4,497.72
Buildings (permanent).....		23,098.10
Seeds and plants.....		977.01
Fertilizers.....		442.50
Feed stuffs.....		9,014.46
Scientific apparatus.....		256.74
Farm machinery and implements.....		3,807.67
Live stock.....		5,933.93
Purchased land.....		5,000.00
Repairs on farm machinery and implements.....		1,113.02
Repairs on buildings.....		4,071.34
Library.....		251.19
Photographic.....		362.21
Exhibit.....		226.90
Miscellaneous.....		3,907.47
	\$135,000.00	\$135,000.00

Expenditures by Substations and Divisions

Numbers.	Amount.
No. 1, Beeville.....	\$ 4,380.86
No. 2, Troup.....	4,278.82
No. 3, Angleton.....	4,507.50
No. 4, Beaumont.....	5,499.96
No. 5, Temple.....	4,001.05
No. 6, Denton.....	6,440.87
No. 7, Spur.....	4,003.33
Sheep Breeding Work (Spur).....	3,500.00
No. 8, Lubbock.....	6,691.53
No. 9, Pecos.....	5,180.88
No. 10, Feeding and Breeding Station, College.....	11,436.62
No. 11, Nacogdoches.....	4,495.25
No. 12, Chillicothe.....	4,999.21
No. 14, Sonora.....	10,040.29
Feeding and Breeding Steer Fund.....	3,939.88
Feeding and Breeding Swine Fund.....	2,060.56
General (Administrative).....	34,654.29
Division of Agronomy.....	4,513.88
Division of Entomology.....	2,700.00
Division of Plant Pathology.....	478.11
Division of Veterinary Science.....	604.99
Division of Dairying.....	3,453.25
Division of Poultry.....	2,655.78
Division of Plant Breeding.....	483.09
Total.....	\$ 135,000.00

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1917

State Substation Treasury.	Sales.	Expenditures.	Balance.
No. 1, Beeville.....	\$ 424.57	\$ 232.56	\$ 192.01
No. 2, Troup.....	470.30	17.32	452.98
No. 3, Angleton.....	798.80	131.07	667.73
No. 4, Beaumont.....	643.32	409.38	233.94
No. 5, Temple.....	739.50	415.47	324.03
No. 6, Denton.....	312.74	1,464.06	.....
No. 7, Spur.....	1,080.75	810.62	270.13
Sheep Breeding Work (Spur).....	1,975.54	721.76	1,253.78
No. 8, Lubbock.....	958.02	955.26	2.76
No. 9, Pecos.....	2,920.44	1,027.19	1,893.25
No. 10, Feeding and Breeding, General.....	20,038.55	20,490.55	.....
No. 10, Feeding and Breeding, Dairy.....	2,083.73	2,076.40	7.33
No. 10, Feeding and Breeding, Poultry.....	661.41	675.03	.....
No. 11, Nacogdoches.....	359.32	99.02	260.30
No. 12, Chillicothe.....	509.87	278.21	231.66
No. 14, Sonora.....	1,158.95	1,245.27	.....
Foul Brood Work.....	847.34	847.34	.....
Photographic.....	474.07	255.57	218.50
Total.....	\$36,457.22	\$32,152.08	\$ 4,305.14

Detail Statement of Expenditures

	Dr.	Cr.
Received from Substation Treasury for the year ending August 31, 1917.....	\$32,152.08	
Salaries.....		\$ 2,017.34
Labor.....		6,209.61
Postage, stationery and office supplies.....		222.50
Freight and express.....		1,122.06
Heat, light and water.....		85.65
Seeds and plants.....		722.60
Fertilizer.....		106.25
Feed stuffs.....		5,854.25
Farm machinery and implements.....		4,602.67
Furniture and fixtures.....		161.90
Scientific apparatus.....		295.43
Live stock.....		3,790.54
Travel expenses.....		656.88
Buildings, etc.....		4,398.40
Library.....		158.10
Miscellaneous supplies.....		1,747.90
Total.....	\$32,152.08	\$32,152.08

Summary

Main Station Receipts	Total	Expenditures	Balance
General (Administrative).....	\$ 151.19	\$ 151.19	.....
Agronomy.....	1,038.00	1,034.81	\$ 3.19
Horticultural.....	13.40	.....	13.40
Total.....	\$ 1,202.59	\$ 1,186.00	\$ 16.59

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1917

Feed Control Service	Dr.	Cr.
Sale of tags.....	\$96,584.63	
Penalties (fines).....	960.00	
Disbursements		
Tags bought.....		\$11,296.99
Analyses.....		5,500.00
Contingent.....		1,769.60
Labor.....		762.74
Office supplies.....		1,142.85
Salaries.....		13,439.13
Travel expenses.....		7,284.15
Publications.....		2,497.62
Surplus.....		53,851.55
Total.....	\$97,544.63	\$97,544.63

Summary

	Dr.	Cr.
Tag account sales.....	\$ 5,603.61	
Inventory on hand.....		\$ 5,603.61
C. O. D. outstanding.....	\$ 736.00	
Surplus.....		\$ 736.00
Working fund account.....	\$10,000.00	
Business Manager A. and M. C.....		\$10,000.00

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1917

Substation Inventories		
No. 1, Beeville Station.....	\$ 17,325.50	
No. 2, Troup Station.....	21,093.12	
No. 3, Angleton Station.....	16,340.73	
No. 4, Beaumont Station.....	14,850.06	
No. 5, Temple Station.....	19,061.08	
No. 6, Denton Station.....	29,854.68	
No. 7, Spur Station.....	17,282.22	
Sheep Breeding Work (Spur).....	8,439.89	
No. 8, Lubbock Station.....	16,839.12	
No. 9, Pecos Station.....	15,543.10	
No. 10, Feeding and Breeding Station.....	87,658.31	
No. 11, Nacogdoches Station.....	11,591.70	
No. 12, Chillicothe Station.....	12,208.59	
No. 14, Sonora Station.....	27,832.90	
		\$315,921.00
Main Station Inventories.		
General (Administrative).....	\$ 52,825.85	
Chemistry.....	6,405.12	
Horticulture.....	2,602.66	
Agronomy.....	14,775.07	
Entomology.....	4,282.90	
Plant Pathology.....	5,319.73	
Veterinary Science.....	3,483.02	
Plant Breeding.....	2,028.31	
Photographic.....	440.79	
		92,163.45
Total.....		\$408,084.45
Summary		
Lands and buildings.....	\$294,274.31	
Furniture and fixtures.....	11,207.63	
Machinery and tools.....	20,871.39	
Scientific apparatus.....	9,235.89	
Harness.....	1,353.79	
Live stock.....	34,574.32	
Chemistry and laboratory supplies.....	4,221.66	
Books and periodicals.....	12,389.91	
Feed Stuffs.....	3,731.42	
Money crops.....	4,258.20	
Postage, stationery and office supplies.....	2,990.58	
Seed for planting.....	1,857.75	
Miscellaneous items.....	7,817.60	
Total.....		\$408,084.45

COLLEGE STATION, TEXAS, August 31, 1917.

Director B. Youngblood, Texas Agricultural Experiment Station, College Station, Texas.

DEAR SIR: I do solemnly swear that the foregoing report upon the receipts and disbursements of the several funds devoted to development, maintenance and support of the Texas Agricultural Experiment Station and its correlated thirteen (13) substations, is just and cor-

rect, and that the funds have been expended in accordance with the Federal and State laws, to the best of my knowledge and belief.

(Signed) CHAS. A. FELKER,
Chief Clerk.

Subscribed to and sworn before me, A. S. Ware, a Notary Public in and for Brazos county, Texas, on the 31st day of August, 1917.

(Signed) A. S. WARE,
[L. S.] Notary Public in and for Brazos county, Texas.

FINANCIAL STATEMENT

Chief Clerk's Report, Texas Agricultural Experiment Station RECEIPTS

From United States Treasurer for the year ending June 30, 1918, Hatch Fund.....		\$ 15,000.00
From United States Treasurer for the year ending June 30, 1918, Adams Fund.....		15,000.00
From State Treasurer for the year ending August 31, 1918, State Substations.....		230,855.54
From Main Station Treasury for the year ending June 30, 1918:		
Main Station Treasury	\$ 404.18	
Balance from previous year	16.59	
		420.77
From State Substation Treasury for the year ending August 31, 1918:		
Substation Treasury	\$ 39,372.39	
Balance from previous year	4,312.99	
		43,685.38
Total.....		\$304,961.69

Government Hatch Fund for the Year Ending June 30, 1918.

Hatch Fund	Dr.	Cr.
Received from the United States Treasurer.....	\$ 15,000.00	
Salaries.....		\$ 8,222.83
Labor.....		1,238.37
Publications.....		1,946.53
Postage and stationery.....		389.82
Freight and express.....		200.22
Heat, light, water and power.....		113.93
Chemical and laboratory supplies.....		62.20
Seeds, plants and sundry supplies.....		154.13
Fertilizers.....		243.00
Feeding stuffs.....		422.15
Library.....		369.98
Tools, machinery and appliances.....		284.61
Furniture and fixtures.....		354.33
Scientific apparatus and specimens.....		92.41
Live stock.....		80.00
Travel expenses.....		438.17
Contingent expenses.....		20.00
Buildings and land.....		415.67
Total.....	\$ 15,000.00	\$ 15,000.00

Government Adams Fund for the Year Ending June 30, 1918

Adams Fund	Dr.	Cr.
Received from the United States Treasurer.....	\$ 15,000.00	
Salaries.....		\$ 9,165.64
Labor.....		1,413.55
Postage and stationery.....		121.18
Freight and express.....		397.65
Heat, light, water and power.....		469.12
Chemical and laboratory supplies.....		959.65
Seeds, plants and sundry supplies.....		257.01
Fertilizers.....		4.80
Feeding stuffs.....		256.54
Library.....		31.10
Tools, machinery and appliances.....		299.46
Furniture and fixtures.....		493.83
Scientific apparatus and specimens.....		414.01
Live stock.....		319.10
Travel expenses.....		36.20
Contingent expenses.....		
Buildings and land.....		361.16
Total.....	\$ 15,000.00	\$ 15,000.00

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1918

State Substations	Dr.	Cr.
Received from the State Treasurer.....	\$230,855.54	
Salaries.....		\$ 57,585.63
Labor.....		33,979.56
Publications.....		3,993.00
Furniture and fixtures.....		6,410.56
Office supplies.....		6,304.92
Freight and express.....		
Travel expenses.....		5,732.32
Buildings (permanent).....		40,028.56
Seeds and plants.....		2,799.82
Fertilizers.....		
Feed stuffs.....		5,448.72
Scientific apparatus.....		1,817.95
Farm machinery and implements.....		5,019.93
Live stock.....		14,110.37
Purchased land.....		9,704.34
Repairs on farm machinery and implements.....		1,321.26
Soil survey.....		6,505.31
Library.....		500.00
Photographic.....		
Exhibit.....		284.32
Miscellaneous.....		5,592.89
Balance (unexpended).....		23,716.08
Total.....	\$230,855.54	\$230,855.54

Expenditures by Substations and Divisions.

Numbers.	Amount.
No. 1, Beeville.....	\$ 4,976.73
No. 2, Troup.....	4,568.44
No. 3, Angleton.....	6,157.13
No. 4, Beaumont.....	4,897.97
No. 5, Temple.....	4,750.01
No. 6, Denton.....	6,703.03
No. 7, Spur.....	5,236.43
Sheep Breeding Work (Spur).....	4,252.81
No. 8, Lubbock.....	6,279.02
No. 9, Pecos.....	5,887.92
No. 10, Feeding and Breeding Station (College).....	15,138.97
No. 11, Nacogdoches.....	4,887.53
No. 12, Chillicothe.....	4,883.92
No. 14, Sonora.....	36,222.02
Division of Agronomy.....	7,022.07
Division of Entomology.....	8,859.47
Division of Plant Pathology.....	1,587.65
Division of Veterinary Science.....	11,771.45
Division of Dairying.....	1,980.09
Division of Forestry.....	1,213.85
Division of Poultry.....	3,055.53
Division of Plant Breeding.....	1,846.94
Division of Swine.....	2,587.69
Division of Horticulture.....	2,057.83
General Administrative.....	49,314.96
Balance (unexpended).....	23,716.08
Total.....	\$ 230,855.54

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1918

State Substation Treasury	Sales	Expendi- tures	Balance
No. 1, Beeville.....	\$ 631.87	\$ 380.14	\$ 251.73
No. 2, Troup.....	1,024.73	243.34	781.39
No. 3, Angleton.....	2,539.64	818.29	1,721.35
No. 4, Beaumont.....	1,476.31	929.41	546.90
No. 5, Temple.....	744.52	1,054.02	.....
No. 6, Denton.....	2,493.73	1,865.62	628.11
No. 7, Spur.....	1,147.54	769.58	377.96
Sheep Breeding Work (Spur).....	3,033.12	1,883.05	1,150.07
No. 8, Lubbock.....	851.29	790.98	60.31
No. 9, Pecos.....	2,687.35	2,099.09	588.26
No. 10, Feeding and Breeding, General.....	24,245.15	27,559.42	.....
No. 11, Nacogdoches.....	716.47	318.67	397.80
No. 12, Chillicothe.....	782.82	667.00	115.82
No. 14, Sonora.....	889.11	1,011.10	.....
General.....	421.73	214.18	207.55
Total.....	\$43,685.38	\$40,603.89	\$ 6,827.25

Detail Statement of Expenditures

	Dr.	Cr.
Received from Substation Treasury for the year ending August 31, 1918.....	\$40,603.89	
Salaries.....		\$ 423.07
Labor.....		2,489.21
Postage, stationery and office supplies.....		390.23
Freight and express.....		1,028.79
Heat, light and water.....		161.47
Seeds and plants.....		586.45
Fertilizer.....		150.74
Feed stuffs.....		22,881.51
Library.....		10.00
Furniture and fixtures.....		121.38
Scientific apparatus.....		321.35
Farm machinery and implements.....		3,717.49
Live stock.....		1,938.32
Travel expenses.....		164.59
Buildings, land, etc.....		1,682.93
Miscellaneous supplies.....		4,536.36
Total.....	\$40,603.89	\$40,603.89

Summary

Main Station Receipts.	Total.	Expendi- tures	Balance
Agronomy.....	\$ 205.87	\$ 145.84	\$ 60.03
Entomology.....	109.70	23.93	85.77
Horticulture.....	19.80		19.80
Veterinary Science.....	85.40	35.20	50.20
Total.....	\$ 420.77	\$ 204.97	\$ 215.80

Texas Agricultural Experiment Station Fund for the Year
Ending August 31, 1918

Feed Control Service	Dr.	Cr.
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Receipts.		
Sale of tags.....	\$115,505.51	
Disbursements.		
Tags bought.....		\$ 24,567.07
Analyses.....		8,893.00
Contingent.....		1,331.98
Labor.....		922.08
Office supplies.....		2,244.47
Salaries.....		17,425.96
Travel expenses.....		9,729.59
Publications.....		2,790.09
Surplus.....		47,601.27
Total.....	\$115,505.51	\$115,505.51

Summary

	Dr.	Cr.
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Tag account sales.....	\$ 9,485.85	
Inventory on hand.....		\$ 9,485.85
C. O. D. outstanding.....	\$ 1,207.36	
Surplus.....		\$ 1,207.36
Working fund account.....	\$ 10,000.00	
Business Manager A. and M. C.....		\$ 10,000.00